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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/635,344	08/06/2003	Alan E. Delahoy	ENPI 0101 PUS	8089

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EXAMINER
MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 08/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/635,344	DELAHOY ET AL.	
	Examiner	Art Unit	
	Rodney G. McDonald	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-9, 11-15, 18-26, 29-34, 36-43, 45, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stollenwerk et al. (U.S. Pat. 6,150,030) (Stollenwerk) in view of Ando et al. (U.S. Pat. 6,458,253).

1. For claim 1, Applicant requires a method for sputter coating a substrate in a sputter coating reactor comprising providing a channel for gas to flow through wherein one or more portions of the channel surface includes at least one target material; flowing gas through the channel wherein at least a portion of the gas is non-laminarly flowing; and generating a plasma wherein the target material is sputtered off the channel surface to form a gaseous mixture containing target atoms that is transported to the substrate.

2. For claim 22, Applicant requires a method for depositing an oxide film on a substrate in a sputter coating reactor comprising providing a channel for a working gas to flow through that has the channel defined by at least one target material; flowing the working gas through the channel non-laminarly; generating a plasma where a portion of the target is sputtered off the target material; and introducing a reactive gas comprising oxygen to form the oxide layer on the substrate.

3. For claim 36, Applicant requires a sputter coating system comprising at least one target material; an electrode having a channel-defining surface that contains at the at least one target material; and a source of non-laminarly flowing working gas.

4. Stollenwerk discloses a substrate coating apparatus (abstract) and a method for using it (col. 4, l. 24-26). The method comprising providing a channel (area between items **1a** and **1b** in Figure 1) between targets in which gas flows through (Figure 1). The gas flows in a turbulent fashion and a plasma is formed so that target material is sputtered to deposit on the substrate (col. 3, l. 28-47). The reactive gas can flow into the chamber after the targets (col. 4, l. 49-59) and react with the magnesium to form magnesium oxide.

5. For claim 2, Applicant requires the gas to be formed by turbulence. As noted above, the gas is turbulent (col. 3, l. 28-47).

6. For claim 3, Applicant requires the gas to be formed by flowing a first portion of a gas in a first direction and a second portion in a second direction that is non-parallel with the first direction. Stollenwerk discloses providing turbulent flowing gas from two separate sources that are flowing in non-parallel directions (Figure 1; items **7** and **11**).

7. For claims 4 and 37, Applicant requires the gas to be formed by flowing the gas through at least tow orifices in non-parallel directions. As can be seen from Figure 1, the gas is formed from more than 2 sources that emit the gas in non-parallel fashion.

8. For claims 5 and 38, Applicant requires the gas to flow through a series of orifices. Figure 1 shows the limitation.

9. For claim 6, Applicant requires the Reynolds number of the turbulence to be at least 2000. Because the gas flow is "turbulent", the Reynolds number is inherently greater than 2000. Applicant has specifically stated that "Typically, turbulent flow is characterized as having a Reynolds number greater than 2000." (See specification at page 7, lines 23-24).

10. For claims 7 and 39, Applicant requires the channel surface to be part of a cathode. The targets are biased and therefore act as cathodes (col. 4, l. 41-44).

11. For claims 8 and 40, Applicant requires the channel to have a rectangular cross section. Figure 1 is in cross section and shows the channel to be rectangular.

12. For claim 9, Applicant requires the power to the target to be DC. Stollenwerk discloses the limitation (col. 4, l. 41-44).

13. For claims 11 and 24, Applicant requires the target to be metal or metal alloy. For claims 12 and 25, Applicant notes that the target can be magnesium. Stollenwerk discloses the target to be magnesium (col. 3, l. 31-32).

14. For claims 13, 31, 32, and 41, Applicant requires the target to be a first target material and a second target material opposite the first target material. Figure 1 shows the targets opposite each other.

15. For claims 14, 33, and 42, Applicant requires the first and second target material to comprise a metal or metal alloy. For claims 15, 34, and 43, Applicant notes that the target can be magnesium. Stollenwerk discloses the targets to be magnesium (col. 3, l. 31-32).

16. For claims 18 and 44, Applicant requires introducing a reactive gas into the chamber. Stollenwerk introduces oxygen of hydrogen (col. 4, l. 57-59).

17. For claims 19, 23, and 45, Applicant requires the reactive gas to be introduced at a position outside the channel. The reactive gas is introduced at a location so that the gas does not directly flow between the targets (col. 4, l. 51-53).

18. For claims 20 and 29, Applicant requires the reactive gas to be oxygen. For claim 21, the reactive gas is molecular hydrogen or molecular oxygen. For claim 30, the reactive gas can be molecular oxygen. When the hydrogen or oxygen reacts, the oxygen or hydrogen is converted to molecular state and thus is an active gas.

19. For claim 26, Applicant requires the oxide film to be magnesium oxide. Stollenwerk forms magnesium oxide (abstract).

20. The difference between Stollenwerk and the present claims is that locating the nozzle within the channel is not discussed.

21. Ando et al. teach locating a working gas nozzle at the end of the target channel but still located within the target channel. The working gas nozzle is made up of the anode 41 through which the working gas is introduced from the feed source 30. (Column 5 lines 31-36; Column 6 lines 21-29; Column 6 lines 50-59; Figs. 1 and 7)

22. The motivation for introducing the sputtering gas within the channel but located at an end of the channel is that it allows for preventing reactive gas form entering the channel to contaminate the target surface. (Column 9 lines 29-38)

23. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Stollenwerk et al. by locating the working

gas nozzle within the channel but yet at an end location within the channel as taught by Ando et al. because it allows for preventing reactive gas form entering the channel to contaminate the target surface.

24. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stollenwerk et al. in view of Ando et al. and further in view of US 5,810,982 to Sellers.

25. For claim 10, Applicant requires the power supply to the target to be pulsed DC power that is asymmetric bipolar.

26. Stollenwerk is described above, but does not disclose the power to be asymmetric bipolar.

27. Sellers discloses using asymmetric bipolar pulsed DC power for sputtering to prevent arcing that occurs when insulating films are sputtered (col. 4, l. 23-32).

28. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modified Stollenwerk in view of Ando et al. by utilizing asymmetric bipolar pulsed DC bias sputtering as taught by Sellers because of the desire to prevent arcing.

29. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stollenwerk et al. in view of Ando et al. and further in view of ***Thin Film Processes*** by Vossen et al. (Vossen).

30. For claim 17, Applicant requires the target to comprise an electrically insulating block and a second electrically insulating block opposite the first block.

31. Stollenwerk is described above, but does not disclose the target to be an electrically insulating block. Stollenwerk does, however, teach reactive sputter deposit from a metal target.

32. Vossen discloses that reactive sputtering can be two art recognized equivalent methods. The first involves depositing from a metal target in a reactive gas atmosphere. The second involves depositing from a sputtering target of the same composition as the desired deposited layer in a reactive gas atmosphere. The only difference between the two reactive sputtering methods is the sputtering rate (pg. 48-49).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Stollenwerk in view of Ando et al. by utilizing reactive sputtering from an insulating MgO target as taught by Vossen because of the knowledge that the method would be an art recognized equivalent.

33. Claims 16 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stollenwerk et al. in view of Ando et al. and further in view of Kadokura (U.S. Pat. 6,156,172).

34. For claims 16 and 44, Applicant's require four targets. The target materials can be the same.

35. Stollenwerk already establishes facing targets and target materials being the same i.e. magnesium. (See Stollenwerk discussed above)

36. Kadokura teaches that four targets can be used in order to form layers. Pairs of targets can face each other in a box type fashion. (See Fig. 5; Column 10 lines 10-17)

37. The motivation for utilizing a four targets is that it allows for preventing degradation in the thin film. (Column 4 lines 1-2)

38. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Stollenwerk in view of Ando et al. by utilizing four targets as taught by Kadokura because it allows for preventing degradation in the thin film.

39. Claims 1-9, 11-15, 18-43, and 47-54 rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,889,295 to Rennie et al. (Rennie) in view of US 6,150,030 to Stollenwerk et al. (Stollenwerk) and US 6,458,253 Ando et al. (Ando et al.)

40. Claims 1-9, 11-15, 18-26, 29-34, 36-43, 45, and 46 are described above. For claim 27, Applicant requires the at least one target to comprise zinc and the oxide to comprise zinc oxide. For claim 28, the target comprises aluminum. For claim 35, the oxide film is aluminum-doped zinc oxide.

41. For claim 47, Applicant requires a method for depositing a nitride film comprising providing a channel for a working gas to flow through that has the channel defined by at least one target material; flowing the working gas through the channel non-laminarly; generating a plasma where a portion of the target is sputtered off the target material; and introducing a reactive gas comprising nitrogen to form the oxide layer on the substrate. For claim 48, Applicant requires the reactive gas to be combined with the working gas while it is flowed through the channel. For claim 49, Applicant requires the reactive gas to be introduced at a position outside the channel. For claim 50, Applicant requires the target to comprise a metal or alloy or semiconductor. For claim 51, the metal can be aluminum or zinc. For claim 52, the nitride can be aluminum nitride. For

claim 53, the target includes first and second target material. For claim 54, the target material is opposite each other.

42. Rennie discloses a method of manufacturing a semiconductor device (abstract) comprising forming a layer such as Al-doped ZnO or AlN by sputtering (col. 4, l. 32-55). The specifics of the sputtering process and apparatus are not described. It is inherent that if aluminum is deposited, as either a doping effect or as AlN, then aluminum is present in the sputtering target. Likewise, if ZnO is formed, then the target inherently contains zinc.

43. Stollenwerk discloses a sputtering apparatus and process comprising providing turbulent flowing gas. The benefit of using the method and apparatus of Stollenwerk is larger area substrates can be processed (col. 1, l. 1-67).

44. Ando et al. discloses a sputtering apparatus where the working gas nozzle is located within the channel but yet at an end location within the channel because it allows for preventing reactive gas form entering the channel to contaminate the target surface. (Column 5 lines 31-36; Column 6 lines 21-29; Column 6 lines 50-59; Figs. 1 and 7; Column 9 lines 29-38)

45. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Rennie to utilize the process and apparatus of Stollenwerk and to have located the nozzle within the channel but yet at an end location within the channel because of the desire to coat large area semiconductor substrates to produce numerous semiconductor chips.

46. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,889,295 to Rennie et al. (Rennie) in view of US 6,150,030 to Stollenwerk et al. (Stollenwerk) and US 6,458,253 Ando et al. (Ando et al.) as applied to claim 1 above, and further in view of US 5,810,982 to Sellers.

47. Claim 10 is described above. Rennie, Stollenwerk, Ando et al. and Sellers are described.

48. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Rennie in view of Stollenwerk and Ando et al. by utilizing asymmetric bipolar pulsed DC bias sputtering as taught by Sellers because of the desire to prevent arcing.

49. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,889,295 to Rennie et al. (Rennie) in view of US 6,150,030 to Stollenwerk et al. (Stollenwerk) and US 6,458,253 Ando et al. (Ando et al.) as applied to claims 1, 13 above, and further in view of ***Thin Film Processes*** by Vossen et al. (Vossen).

50. Claim 17 is described above. Rennie, Stollenwerk, Ando et al. and Vossen are described above.

51. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Rennie in view of Stollenwerk and Ando et al. by utilizing reactive sputtering from an insulating ZnO target as taught by Vossen because of the knowledge that the method would be an art recognized equivalent.

52. Claims 16 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,889,295 to Rennie et al. (Rennie) in view of US 6,150,030 to Stollenwerk et

al., (Stollenwerk) and US 6,458,253 Ando et al. (Ando et al.) as applied to claims 1, 13, 36, 41 above, and further in view of Kadokura (U.S. Pat. 6,156,172).

53. For claims 16 and 44, Applicant's require four targets. The target materials can be the same.

54. Stollenwerk already establishes facing targets and target materials being the same i.e. magnesium. (See Stollenwerk discussed above)

55. Kadokura teaches that four targets can be used in order to form layers. Pairs of targets can face each other in a box type fashion. (See Fig. 5; Column 10 lines 10-17)

56. The motivation for utilizing a four targets is that it allows for preventing degradation in the thin film. (Column 4 lines 1-2)

57. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Rennie in view of Stollenwerk and Ando et al. by utilizing four targets as taught by Kadokura because it allows for preventing degradation in the thin film.

Response to Arguments

Applicant's arguments filed June 8, 2006 have been fully considered but they are not persuasive.

In response to the argument that Stollenwerk does not teach a working gas emanating from a nozzle placed in the channel defined by one or more target surfaces, it is argued that Ando et al. was cited to teach placing a nozzle in a channel defined by one or more target surfaces. Stollenwork was relied upon to teach a nozzle for creating turbulences. Also Ando et al.'s nozzle teach that the gas inlet structure is a porous

material and that such a porous material would cause the flow to be nondirectional and therefore turbulent. Furthermore, any gas arising from a nozzle in sputtering after a particular distance would take on a turbulent flow due to the eddying and swirling from its regular path thus causing sputtering. (See Stollenwerk and Ando et al. discussed above)

In response to the argument that Stollenwerk does not seek to induce turbulence in the channel, it is argued that Ando et al. suggest inducing turbulence in the channel. Specifically Ando et al.'s nozzle teach that the gas inlet structure is a porous material and that such a porous material would cause the flow to be nondirectional and therefore turbulent. Furthermore, any gas arising from a nozzle in sputtering after a particular distance would take on a turbulent flow due to the eddying and swirling from its regular path thus causing sputtering. (See Stollenwerk and Ando et al. discussed above)

In response to the argument that Ando et al. is completely silent on the issue of turbulence or non-laminar flow, it is argued that since Ando et al.'s gas inlet structure is a porous material that would cause gas flow to be non-directional and therefore would be turbulent or non-laminar. (See Ando et al. discussed above)

In response to the argument that Ando et al. do not teach positioning the nozzle within the channel per se, it is argued that Ando et al. teach that the gas inlet structure is located within a channel between at least one target surface. (See Ando et al. discussed above)

In response to the argument that Ando et al. can not be combined with Stollenwerk because Ando require the gas to be between the targets whereas

Stollenwerk does not, it is argued that Ando et al. and Stollenwerk can be combined since both are related to sputtering and Ando et al. suggest relocating the nozzle into the channel in order to prevent contamination of the target surface. (See Ando et al. and Stollenwerk discussed above)

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
August 9, 2006